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ML Researchers explore microbial hydrogen

by Timothy R. Anderl, Materials and Manufacturing Directorate

TYNDALL AIR FORCE BASE, Fla. — Researchers are developing a biological method of producing hydrogen from waste streams created by dining halls, kitchens, latrines, hospitals, laundry facilities and showers at bare base facilities.

When successful, researchers from Air Force Research Laboratory's Materials and Manufacturing Directorate will have demonstrated that hydrogen production from bare base waste streams is a feasible alternative source of energy for fuel cells. Using hydrogen as an alternative energy source is an exciting option due to its high conversion efficiency and nonpolluting nature.

Bare base facilities have as many as 1,100 military personnel who live in temporary housing. Their mission often requires the base to function for several years, with little or no services provided by the host nation. Currently, MEP-12 diesel generators produce the electrical power needs of the base.

A two-reactor system, currently being developed by researchers from ML's Weapons Systems Logistics Branch, is expected to reduce logistical burdens, pollution, and noise associated with using current diesel energy generators for energy production. Fuel cells driven by hydrogen will lower diesel fuel consumption, and minimize the use of fossil fuels for production of hydrogen.

Though hydrogen is the most abundant element on earth, it is bound to other elements and has to be separated before it can be used in energy generation. Microorganisms contain enzymes that can produce hydrogen from waste materials, providing a seemingly inexhaustible source of material for hydrogen production.

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Dr. William Wallace and Ted Morolla examine the fluidized bed reactor during operation. (Air Force photo)

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Researchers (from page 1)

In order to fully extract the hydrogen from organic molecules, ML experts have developed a two-stage process: a fermentative reactor with a photosynthetic bacterial hydrogen production process. The photosynthetic reaction uses the energy from sunlight to completely convert organic acids to carbon dioxide and hydrogen molecules.

By using microorganisms, such as bacteria, in hydrogen production, the production process would encourage additional waste recycling, reducing waste disposal and treatment needs of nations hosting the base. Also, no additional carbon dioxide is released during this process. The process is similar to biodegrading organic molecules at a wastewater treatment facility. However, at the wastewater facility the hydrogen is not collected or used.

In the past, scientists have developed thermochemical and electrochemical methods for hydrogen generation, but these processes are energy intensive and are not always environmentally friendly. Biological methods, like the ones used by AFRL present a less energy intensive means of hydrogen production. These occur at ambient temperatures and pressures, which require very little energy and predominantly generate hydrogen and carbon dioxide.

Researchers built an up-flow fixed bed anaerobic reactor to begin testing biological hydrogen production. The reactor was filled with earth pellets that provide abundant sites for the bacteria to attach and form biofilms. A soil sample, which contained the bacteria and sucrose solution, was introduced to the earth pellets. The reactor was operated at low flow rates to allow the bacteria to colonize the earth pellets and as bacteria degraded the sucrose, carbon dioxide and hydrogen were produced.

This initial fixed bed reactor had problems channeling the flow of the sucrose solution through the pellets. To correct this, ML engineers created a fluidized bed reactor, which eliminated the channeling problem and allowed formation of a uniform biofilm. The improved reactor consistently produced 60 to 80 percent hydrogen. Future studies conducted by the group will include operation of a reactor that replaces sucrose with actual airbase wastewater as the carbon and energy source.

The information gained from operation of the bench scale reactor will be necessary to assess the hydrogen available in base waste streams, and determine whether adoption of this process is cost-effective. Success of the project will expand opportunities to develop the process as an alternative energy source for other industrial operations. @

Other features online include:

**Commander visits
Edward Research Site**

**AFRL Contracting Director
set to retire**

AFRL announces annual Contracting Award winners

by Katherine Gleason, AFRL Public Affairs

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — The Air Force Research Laboratory recently announced its 2002 Annual Contracting Award winners, which recognize the outstanding individual, team, and organizational accomplishments of contracting professionals. Honorees were recognized at the AFRL Contracting Awards Banquet in Ft. Walton Beach, Fla. on March 11.

Additionally, four of AFRL's winners were also chosen for recognition by the Air Force Materiel Command. AFMC level winners were: 1st Lt. Christian Leimkuehler, Jane Hendricks, the AFRL/Det. 1 Radiation Hardened Capital Expansion Team, and the Information Directorate Contracting Division. AFMC winners were honored at the Annual Contracting Awards banquet at Wright-Patterson AFB on Mar. 25.

Outstanding CGO in Contracting (S&T)

Leimkuehler, a contract specialist in the Information Directorate's Information Grid and Systems Branch, was honored for providing outstanding support beyond his normal duties during FY02. He showed willingness to take on additional responsibilities, learn new skills and train others.

Outstanding Civilian (GS-12 and Above) in Contracting (S&T)

Hendricks, of the Propulsion Directorate's Advanced Propulsion and Turbine Contracting Branch, served as the senior PCO and business advisor for the \$750M Integrated High Performance Turbine Engine Technology program. She was recognized for her efforts in planning, developing and implementing acquisition strategy for many complex and high priority programs within AFRL.

Outstanding Civilian (GS-11 and Below) in Contracting (S&T)

Suntok McGuinness, a contract negotiator at Edwards Air Force Base was chosen for her innovative thinking and ceaseless efforts. She was noted for her willingness to volunteer to handle both new awards that required immediate action, and complex modifications that needed detailed analysis and negotiations.

Outstanding Contract Staff (Field)

Stephen Sandager received this award by distinguishing himself in his commitment to acquisition excellence at Kirtland Air Force Base. While working as a procurement analyst for AFRL Det. 8, Sandager led an initiative to develop and maintain a knowledgeable work force by conducting monthly seminars for Det. 8 AFRL/PK and Technology Directorate personnel.

Outstanding Contract Clearance

A procurement analyst for the Information Directorate's Acquisition Development Branch, Gary Slopka provided outstanding support as clearance advisor for approximately 65 percent of FY02 new contract actions. He conducted clearance reviews in support of both research and development and operational contracting branches.

Outstanding Contracting Support

Although she has since retired, Patricia Martin spent FY02 serving as the "go to" person for 130 people. She served as the expert on DD350 and DD2566 reporting, and developed hands-on training for all of Det. 1 AFRL.

Secretary of the Air Force Professionalism in Contracting (Supervisory)

This award was presented to Steven Ewers, Chief, Informa-

tion/Sensor Application Contracting for the Sensor's Directorate's Information/Sensor Application Branch. Ewers developed and motivated his team to maximize productivity, achieving optimal performance with a heavy workload and a 45 percent turnover in personnel.

Secretary of the Air Force Professionalism in Contracting (Nonsupervisory)

Working as a contract negotiator for the Materials and Manufacturing Directorate, Stephen Davis has been actively involved in the continued growth and development of numerous individuals both in and out of the contracting field.

Outstanding Contracting Contingency (Officer)

Capt. John Del Barrio distinguished himself serving as Logistic Director and Contingency Contracting Officer, United States Central Command Liaison Team in Islamabad, Pakistan, in support of Operation Enduring Freedom. He was instrumental in freeing more than 1,000 worldwide shipments delayed in customs for in excess of six months, which helped multiply the force protection for deployed members.

Outstanding Pricing (Team)

The Det. 8 Pricing Branch, was recognized for its commitment to outstanding support to PCOs and buyers conducting research and development and operational acquisitions. They provided high-quality pricing and negotiation support, developed innovative pricing tools, and presented comprehensive pricing education in their pursuit of superior customer support. Team members are: Gelaine Jensen, Rosemary Sharpe, Diane Kirby, Linda Aldridge, Jill Harral, Mary Roybal, Yolanda Shannon and Cheryl Laskowski.

Outstanding Achievement in Contracting Information Technology (Team)

This award was presented to Det. 8 Information Technology. Members are Georgia Garcia, John Webb, Sharon Duran and Matthew DeBack. This team was recognized for its commitment to acquisition excellence at Kirtland Air Force Base. The team provided steadfast support to the buyer and contracting officer teams, enabling timely awards of high-quality, enforceable contracts.

Outstanding Contracting Team

Receiving this honor was the Radiation Hardened Capital Expansion Team from Det. 1, consisting members Timothy Jones, Sheila Titer, Susan Palmer and Stephan Davis. The team was honored for establishing the business approach for this unique and highly visible \$167M Defense Production Act, Title III project.

Outstanding Contracting Unit (S&T)

This year's recipient of the Outstanding Contracting Unit Award went to the Information Directorate's Contracting Division. During FY02, this unit awarded more than 3000 contracts and assistance agreements, totaling nearly \$500M. Customer service also plays an important role, with the division continually looking for innovative process improvements. As a result of their efforts, Rome Research Site enjoyed an expanded customer base with a total value 13 percent higher than the previous year. @

Individuals key to command's transformation success

by **Gen. Lester L. Lyles, Commander, Air Force Materiel Command**

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Recently, I discussed with you my expectations for Air Force Materiel Command transformation: to develop an expeditionary mindset; become more innovative, adaptive and responsive; operate more effectively and efficiently; and be easier to do business with.

These expectations enable the command's vision to provide military capabilities through superior acquisition and sustainment for Defense Department warfighters and their allies - now and in the future.

We now have more than 200 initiatives across the command to meet these expectations, and I could not be more proud of your efforts to improve our support to the warfighter!

Major efforts such as Depot Maintenance Reengineering Transformation, the Spares Campaign, Predictive Support Awareness, Agile Acquisition, Test and Evaluation Transformation, the Air Force Research Laboratory's capability integration efforts and our scientist and engineer recruiting and retention initiatives, to name a few, are leading our journey.

Divestiture of nonessential efforts has proven to be a great way to reinvest resources to provide direct payback to the warfighter. Since August, almost 300 divestiture candidates have been submitted, resulting in eliminating, improving or resolving misunderstandings for each candidate. The secretary of the Air Force and the chief of staff are our champions for these divestiture efforts, which have eliminated almost 60,000 hours of nonessential work to date.

As these initiatives continue, we are working with the Assistant Secretary of the Air Force for Acquisition Dr. Marvin Sambur and his team to streamline our acquisition processes. Until recently, we focused on individual weapon system programs through the Integrated Weapons System Management philosophy.

This approach proved to be very successful as a fundamental strategy to improve specific, or vertical, program life cycle management and accountability, but the increasing demands for interoperability and commonality demand a new way of doing business.

In order to meet those demands and promote horizontal integration, we developed the product enterprise concept. This approach provides integrated solutions by shifting our focus away from platform-centric thinking and toward capabilities- and effects-based

thinking. To focus attention on these enterprises, our product center commanders were assigned as enterprise leaders for each product enterprise established: command and control, aeronautics, armament, and space and ballistic missiles.

This approach provided an ideal foundation for Capabilities-Based Life Cycle Management - a new direction for AFMC and SAF/AQ that will provide a set of fully supportable, integrated solutions capable of meeting the needs and effects required by the warfighter.

Our first step in this new direction is the Agile Acquisition Concept of Operations I recently signed with Dr. Sambur, which formalizes our partnership with SAF/AQ. It clearly delineates SAF/AQ's role as the lead for acquisition policy and processes and AFMC's vital role as the supporting organization providing people, resources, tools and expertise.

We are now working together with Dr. Sambur and his team to reengineer processes and implement this concept of operations in the most effective and efficient manner. Our joint goal remains unchanged: to meet the warfighter's needs!

This concept of operations and our other transformation initiatives are enabling us to continue providing world-class support in an ever-changing environment. Transformation in AFMC is not just a matter of doing things better, faster or cheaper. It is the evolution of our command to grow with the Air Force and take the necessary steps to ensure we continue to meet our warfighters' needs.

I am very excited about our future! We are well on our way in this transformation journey and there are a multitude of opportunities to progress even farther. We will meet future demands by reengineering our processes and continuing to fulfill our responsibilities to train, organize and equip an outstanding team of research and development, acquisition, sustainment, and test and evaluation professionals.

Our mission is complicated, yet no one in the world does it better! I hear this often from leaders across the Air Force and the warfighting commands.

We have been in operation for more than 50 years in one form or another, with processes growing to meet changing Air Force requirements. Your part in this journey is key to our success as we continue to reengineer our processes and transform AFMC to enhance our support to the warfighter. @

Propulsion chemist honored by American Chemical Society

by **Ranney Adams, Propulsion Directorate**

EDWARDS AIR FORCE BASE, Calif. — Dr Karl O. Christe has been presented the American Chemical Society's (ACS) 2003 Inorganic Chemistry Award. Christe is a research chemist and Senior Staff Advisor at the Air Force Research Laboratory's Edwards Research Site.

On March 25, 2003, Christe's chemistry award was presented during the ACS's black-tie awards ceremony and banquet dinner. He received it from the ACS's President-elect Charles P. Casey and Mike Willis, who represented the award sponsor, Aldrich Chemical Co., Inc. The dinner was part of the 225th ACS National Meeting held at the Ernest N. Morial Convention Center in New Orleans, La.

ACS awards are designed to recognize individual accomplishments in diverse fields of chemistry. They are renowned throughout the scientific world. A major address on Christe's research was

presented to the ACS Inorganic Chemistry Division at the meeting. Aldrich Chemical Co., Inc. has sponsored the ACS Inorganic Chemistry Award since 1998.

Christe was nominated for the award based on his lifetime achievements in chemistry.

Described as a trailblazer, Christe has been often cited in inorganic chemistry textbooks for his synthesis and characterization of numerous novel halogen fluorides and the development of the first quantitative scales for oxidizer strength and Lewis acidity. Using his experimental skills combined with theoretical predictions, his career has been based on striving for spectacular breakthroughs rather than small incremental improvements. He has earned a reputation for finding answers to chemical problems declared unsolvable by others. @

ML researcher recognized by Affiliate Societies Council

by *Pete Meltzer Jr., Materials and Manufacturing Directorate*

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — A senior research chemist at the Air Force Research Laboratory's Materials and Manufacturing Directorate (ML) was recognized by the Affiliate Societies Council (ASC) of Dayton, Ohio, Feb. 20, 2003. The recognition took place at the organization's 44th Annual Awards Banquet.

Dr. Loon-Seng Tan of the Nonmetallic Materials Division was recognized for contributions supporting operational and future Air Force systems, and expertise in high temperature, synthetic polymer chemistry. His work with benzocyclobutene (BCB) and aromatic heterocyclic polymer systems have led to numerous successes in the directorate's Polymer Branch and have been critical to the transitioning of research breakthroughs to industrial development, Affiliate Societies Council said.

Each year, the 15,000-member council recognizes engineers and scientists from throughout the Greater Dayton area for outstanding technical accomplishments in their research field. Tan was one of 11 members honored this year.

Tan is the ML Directorate's research group leader for polymer synthesis and characterization. In addition to leading and conducting in-house research in structural, opto-electronic and multi-functional materials, he also initiates and monitors research and development contracts complementary to the directorate's in-house research programs.

Tan's achievements cover a diverse range of scientific and technological areas. He discovered a new addition cure chemistry that led to the development of BCB materials; conceived and demonstrated a chemical route to improve the toughness and use temperature of bismaleimide (BMI) resins using addition chemistry; and successfully developed a family of new rigid-rod high molecular weight pseudo-ladder polymers. Tan is also credited with developing highly active two-photon chromophores and a radically new approach to one-component molecular composite manufacturing using in-situ rigid-rod formation to prevent phase separation.

In addition, Tan has designed and synthesized acid-stable ther-

moset monomers that can be used as a matrix resin in molecular composite technology. He also conceived and experimentally proved a route to control the conductivity of plastic bonded explosives by incorporating triaryl amino and diphenyl amino functions into rigid-rod backbones.

Tan earned his undergraduate degree in chemistry from Harvey Mudd College in Claremont, Calif., in 1976 and received a doctorate degree in Inorganic Chemistry from Indiana University in 1981.

Tan is a member of several professional organizations, including the American Chemical Society, the Society for the Advancement of Materials Processing and Engineering, and the Materials Research Society. He was an assistant professor of Chemistry at Wright State University, and is a former associate research scientist for the University of Dayton Research Institute.

His selection recognizes his ideas, leadership and motivation toward high achievement in materials research required for current and future Air Force systems. @



Affiliate Societies Council Award recipient Dr. Loon-seng Tan at work in the ML Directorate (Air Force photo by Pete Meltzer Jr.)

DE Director retires after life-long Air Force career

by *Juventino Garcia, Directed Energy Directorate*

KIRTLAND AIR FORCE BASE, N.M. — Dr. R. Earl Good, the Air Force's most senior director-scientist, was retired at a ceremony April 4, by visiting Gen. Lester L. Lyles, commander of Air Force Materiel Command.

Good, a government veteran of nearly 40 years with the United States Air Force and the director of the Air Force Research Laboratory's Directed Energy Directorate, was also presented the Outstanding Civilian Career Service Award.

In a citation accompanying the award, Good was recognized for significant achievements in a long and varied career as a researcher, director and mentor. Praised were his scientific works as a researcher on atmospheric dynamics, chemistry and composition, and as a team leader measuring atmospheric optical turbulence.

As the unit's director, Good managed a 600-person organization that serves as the Air Force's focal point for high-energy laser research. The directorate also functions as the Department of Defense's primary

organization for high-power microwave research and conducts scientific efforts in a variety of directed energies and imaging technologies.

Among his more recent accomplishments, Good initiated a program for large, deployable space optics and relay mirrors that could revolutionize surveillance, communication, and battlefield illumination, including identifying and designating targets. He established a program for applying high-power lasers and microwaves on-board a wide range of air vehicles for aircraft self-defense, suppression of enemy air defense, and applying offensive force.

Good arrived at Kirtland Air Force Base in 1993 to be the executive director of the Phillips Laboratory, and went on to his present position when Phillips evolved to the current organization in 1997.

A member of the U.S. government's Executive Service since 1998, Good began his career in the Air Force in 1967, as a staff scientist, project officer and supervisory physicist at the Air Force Geophysics Laboratory at Hanscom Air Force Base, Mass. @

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Due to the number of submissions we receive, some sections of *news@afrl* are available exclusively on-line. The on-line version of the newsletter allows users to view the AFRL corporate calendar, news releases generated by AFRL headquarters, operating instructions, L@b L@urels and Roundups sections.

The L@b L@urels section of the electronic newsletter is dedicated to members of Air Force Research Laboratory who receive awards and honors. The Roundups section of the electronic newsletter keeps Air Force Research laboratory employees informed about contracts AFRL has awarded. Below is an index of articles one can find in each of these on-line sections.

L@b L@urels

- AFRL members named to Old Crow Association
- IF engineer honored for IEEE contributions
- Rome program manager honored by MVEEC

Roundups

- Rome awards contract to Black River Systems Co., Utica
- AFRL Rome awards two-year agreement to Ithaca firm
- Rome awards \$1.2M contract for software development

To view the full text of these and other articles visit the *news@afrl* page on the Internet at <http://extra.afrl.af.mil/news/index.htm>.

To submit L@b L@urels or Roundups from your directorate, send a query to AFRL Public Affairs at:

Jill.Bohn@afrl.af.mil

*For more on these stories see news@afrl
<http://extra.afrl.af.mil/news/index.htm>*

Simulator to educate, attract new recruits to Air Force



WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Brian Dicks, Air Force Research Laboratory's Air Vehicles Directorate, instructs Maj. Cynthia Brown, commander of the 345th Recruiting Squadron, Scott Air Force Base, Ill., as she flies in a simulator March 21 in Bldg. 145, Area B. Dicks, a University of Cincinnati co-op student, was part of a team of engineers that designed, built and delivered the simulator to the recruiting squadron. The simulator will be used by recruiters to educate young people about career opportunities in the Air Force. (Air Force photo by Spencer P. Lane)